RECORD OF DECISION

Cayuga County Groundwater Contamination Superfund Site

Cayuga County, New York

United States Environmental Protection Agency

Region II

New York, New York

March 2013

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Cayuga County Groundwater Contamination Superfund Site, Cayuga County, New York

Superfund Site Identification Number: NYN000204289

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) documents the U.S. Environmental Protection Agency's selection of a groundwater remedy for the Cayuga County Groundwater Contamination Site chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. Sections 9601 - 9675, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. This decision document explains the factual and legal basis for selecting a remedy to address the contaminated groundwater and drinking water at the Site. The attached index (See Appendix III) identifies the items that comprise the Administrative Record, upon which the selected remedy is based.

The New York State Department of Environmental Conservation (NYSDEC) was consulted on the planned remedy in accordance with CERCLA Section 121(f), 42 U.S.C. Section 9621(f), and NYSDEC concurs with the selected remedy (see Appendix IV for the NYSDEC Concurrence letter). EPA engaged in government-to-government consultation with the Cayuga Nation and the Cayuga Nation does not agree with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health or welfare or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The response action described in this document represents the first remedial phase for the Site. It actively addresses drinking water and groundwater contamination in Area 1 and Area 2, and is considered a final action for this portion of the Site as well as for drinking water in Area 3. Groundwater and surface water contamination in Area 3 will be deferred for further investigation. For remedial planning and cost estimating purposes, the Site has been divided into three approximate areas. Area 1 consists of the impacted area immediately south of the Powerex Facility a facility formerly operated by Powerex, Inc., located at 2181 West Genesee Street, in the City of Auburn, New York, which is a major source of groundwater contamination and extends approximately 700 to 900 feet south of West Genesee Street. Area 2 consists of the impacted area immediately south-southwest of Area 1, and extends to the southwest to the Town of Aurelius.

Area 3 consists of the impacted area immediately south and southwest of Area 2, extending to, and including Union Springs Village. (Refer to Figure 2 in Appendix I).

In response to public comments, the selected remedy defers action in Area 3 except for activities that ensure protection of drinking water. EPA will conduct further investigations of the groundwater and surface water in Area 3. The source of the groundwater and surface contamination at the Powerex Facility will be addressed under the State Superfund program.

The major components of the selected remedy include the following:

Common Elements

- Connection of impacted residences to municipal water for their future potable water needs, including any current or new residences impacted by the Site. Existing groundwater treatment systems at three dairy farms will be maintained, as necessary, or connected to the public water system. Point of entry treatment systems (POETs) will be provided, as necessary, and maintained until the connection to the public water supply is completed;

- Development of an Institutional Controls Implementation Action Plan which should specify institutional controls to insure that the remedy is protective. Implementation of institutional controls in the form of any local laws that limit installation of drinking water wells and informational devices such as advisories published in newspapers and letters sent to local government authorities to limit exposure to contaminated groundwater;

- Implementation of a program of long-term monitoring of contaminants in the groundwater plume to track and monitor changes in the concentrations of contaminants and measure progress towards attainment of the Remedial Action Objectives (RAOs);

- Development of a Site Management Plan (SMP) that will provide for the proper management of the Site remedy post-construction. The SMP will include provisions for any operation and maintenance and long-term monitoring required for the remedy; as well as periodic certifications; and

- The remedy will also include measures to ensure that the Village of Union Springs public water supply treatment system is adequately equipped to protect users of its supply from Site-related contamination. While the wellhead treatment system was upgraded in 2001 by using an air stripper to treat Site-related contamination that had impacted the supply wells, additional measures need to be implemented to ensure that the system is capable of continuously distributing water that does not exceed drinking water standards for the Site-related contaminants. A backup generator will be provided to power the existing air stripper during power outages, and a second air stripper (or other comparable system/equipment) will be put in place to ensure that operations are not interrupted.

Area 1: Enhanced In-Situ Biological and Abiotic Remediation - Alternative 3

The selected remedy involves the in-situ treatment of contaminated groundwater to promote reductive dechlorination of chlorinated solvents in the in the deep portion of the aquifer designated as the D3 and described further below. A network of wells will be installed in Area 1 where chemical agents will be delivered to the subsurface at the impacted depths. Once delivered, these chemicals will promote reductive dechlorination, decreasing contaminant concentrations. Under the selected remedy, both biological and abiotic processes are enabled during the in-situ biogeochemical transformation process to promote reductive dechlorination of chlorinated solvents to achieve federal maximum contaminant levels (MCLs) or more stringent state standards. This remedy component will utilize a flexible approach that could include a combination of one or more process options. The details of the selected process will be determined in a pilot study during the remedial design. The well network will be designed with the placement of wells at high yield locations and close to flow paths. Figure 3 in Appendix I provides the conceptual design of well locations.

Area 2: Monitored Natural Attenuation – Alternative 4

The selected remedy involves monitoring of naturally occurring, in-situ processes, to decrease the mass or concentration of contaminants in groundwater in Area 2. Under this portion of the remedy, additional monitoring wells as shown in Figure 4 will be installed and included as part of the monitoring well network. The monitoring program will consist of periodic monitoring for parameters such as volatile organic compounds (VOCs), geochemical indicators and hydrogeologic parameters in the monitoring well network. The monitoring program will be used to evaluate remedy effectiveness and to ensure protection of human health and the environment. The monitoring program will be designed to verify that natural attenuation is occurring and will meet the RAOs.

The selected remedy includes contingency remedies for Area 1 and/or Area 2.

Contingency Remedies for Area 1 and Area 2:

The contingency remedies for Area 1 and/or Area 2 will be implemented if EPA determines that one or more of the following circumstances occur:

- Enhanced In-Situ Biological and Abiotic Remediation in Area 1 and/or Monitored Natural Attenuation in Area 2 in conjunction with source control at the Powerex Facility is unlikely to achieve MCLs in a reasonable timeframe based on data collected and thus is not protective of human health or the environment; or

- Long-term monitoring of groundwater and surface water in the vicinity of the Village of Union Springs reveals that the VOC contamination is increasing and creating an unacceptable risk to receptors, such that the actions undertaken in Area 1 or Area 2 are not protective of human health and environment; or

- Long-term monitoring reveals stalling/incomplete reductive dechlorination of the contaminants of concern at the Site, despite efforts to modify the treatment regime; or

- The Area 1 pilot study for enhanced in-situ biological and abiotic remediation called for in this ROD demonstrates that the RAOs are unlikely to be met in a reasonable timeframe.

Area 1: Groundwater Pump and Treat – Alternative 2

The contingency remedy for this area involves the extraction of groundwater via pumping wells and treatment prior to disposal. Groundwater would be pumped to remove contaminant mass from areas of the aquifer with elevated concentrations of contaminants. Groundwater extraction wells would be installed in the D3 zone of the aquifer. A treatment plant with a capacity of approximately 400 gallons per minute (gpm) would be constructed within or near the Powerex Facility to achieve the RAOs. Extracted groundwater with VOC contamination would be treated by air stripping. Figure 5 in Appendix I provides the conceptual design of well locations. Air stripper effluent may be treated with a thermal oxidizer system, in accordance with federal and State regulations prior to being discharged into the atmosphere, if necessary. Due to the variation in hydraulic and hydrogeologic properties, as well as the contaminant concentrations, during the remedial design, pilot studies and performance tests will be conducted to determine the number and location of extraction wells needed to ensure that the required RAOs are achieved. During the remedial design, a determination will also be made either to discharge treated extracted groundwater to surface water or to reinject it to groundwater.

Area 2: Enhanced In-Situ Biological and Abiotic Remediation – Alternative 3

The contingency remedy involves the in-situ treatment of contaminated water to promote reductive dechlorination of chlorinated solvents in the D3 zone in Area 2. A network of wells will be installed in Area 2 where chemical agents will be delivered to the subsurface at the impacted depths. Once delivered, these chemicals will promote reductive dechlorination, decreasing contaminant concentrations. Under this contingency remedy, both biological and abiotic processes are enabled during the in-situ biogeochemical transformation process to promote reductive dechlorination of chlorinated solvents. This remedy component will utilize a flexible approach that could include a combination of one or more process options. The details of the selected process will be determined in a pilot study during a remedial design phase. The well network will be designed with the placement of wells at high yield locations and close to flow paths. Figure 4 in Appendix I provides the conceptual design of well locations.

The Powerex Facility continues to be a source of VOC contamination to groundwater at this Site. The source investigations and other response actions for the Powerex Facility are being addressed by GE with NYSDEC oversight pursuant to New York State law. Remedial actions for the Powerex Facility are not the focus of this decision document, although successful remediation (i.e., source control or removal) of the source area(s) at the Powerex Facility is important to the full realization of the benefits of the selected remedy in this ROD. In the event that source control is not successfully implemented pursuant to New York State law, EPA may elect to evaluate additional options at the Powerex Facility pursuant to CERCLA to ensure the effectiveness of the selected remedy.

The environmental benefits of the preferred remedy may be enhanced by giving consideration, during the design, to technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy.[1] This will include consideration of green remediation technologies and practices.

DECLARATION OF STATUTORY DETERMINATIONS

Part 1- Statutory Requirements

The selected remedy meets the requirements for remedial actions set forth in CERCLA Section 121, 42 U.S.C. Section 9621, because it meets the following requirements: 1) it is protective of human health and the environment; 2) it meets a level of standard of control of the hazardous substances, pollutants, and contaminants which at least attains the legally applicable or relevant and appropriate requirements under the federal and State laws; 3) it is cost-effective; and 4) it utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Part 2- Statutory Preference for Treatment

The selected remedy meets the statutory preference for the use of remedies that involve treatment as a principal element.

Part 3- Five-Year Review Requirements

This remedy will not result in hazardous substances, pollutants, or contaminants remaining at the Cayuga County Groundwater Contamination Site above levels that would allow for unlimited use and unrestricted exposure. However, because it may take more than five years to attain the cleanup levels, pursuant to Section 121(C) of CERCLA, policy reviews will be conducted no less often than once every five years after the completion of construction to ensure that the remedy is, or will be, protective of human health and environment.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file located in the information repository.

- Contaminants of concern and their respective concentrations may be found in the "Site Characteristics" section.
- Potential adverse effects associated with exposure to Site contaminants may be found in the "Summary of Site Risks" section.
- A discussion of cleanup levels for chemicals of concern may be found in the "RAOs" section.
- A discussion of principal threat waste is contained in the "Principal Threat Waste" section of the ROD.

[1] See http://epa.gov/region2/superfund/green_remediation

- Current and reasonably-anticipated future land use assumptions are discussed in the "Current and Potential Future Land and Groundwater Uses" section.
- Potential groundwater use that will be available at the Site as a result of the selected remedy is discussed in the "RAOs" section.
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs are discussed in the "Description of Alternatives" section.
- Key factors that led to selecting the remedies (i.e., how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decisions) may be found in the "Comparative Analysis of Alternatives" and "Statutory Determinations" sections.

AUTHORIZING SIGNATURE

Walter E. Mugdan, Director
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Date

DECISION SUMMARY

Cayuga County Groundwater Contamination Superfund Site

Cayuga County, New York

United States Environmental Protection Agency
Region II
New York, New York
March 2013

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SITE NAME, LOCATION, AND DESCRIPTION

The Cayuga County Groundwater Contamination Site (Site) includes a groundwater plume located in Cayuga County, New York. Groundwater contaminated with volatile organic compounds (VOCs) extends from the City of Auburn to the Village of Union Springs, a distance of approximately of seven miles, and includes the Towns of Aurelius, Fleming, and Springport.

Cayuga County, which is located in the west central part of New York State, is in an area referred to as the Finger Lakes Region. Cayuga County is approximately 694 square miles in area and has a population of 79,526 (U.S. Census 2009). The City of Auburn is the county seat and is located in the northern portion of the area investigated by EPA. A Site location map is provided as Figure 1 in Appendix I.

The area contains mostly residential properties intermingled with extensive farmland and patches of woodlands, as well as some commercial areas. Some of the contaminated groundwater plume underlies the ancestral lands of the Cayuga Nation as recognized by the 1794 Treaty of Canandaigua, including a property currently belonging to the Cayuga Nation (in the southwestern portion of the Site).

Two public water supply systems serve residences at the Site. The Village of Union Springs, on the east shore of Cayuga Lake, operates two water supply wells. Groundwater from these two wells is treated using an air stripper to remove VOCs. The City of Auburn provides drinking water to the Cayuga County Water and Sewer Authority and the Town of Springport which distributes drinking water to the area south and west of Auburn. The City of Auburn draws its drinking water from Owasco Lake, which has not been impacted by the Site.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

The major source of the groundwater contamination at the Site is a facility located at 2181 West Genesee Street, City of Auburn, New York (Powerex Facility). Between 1951 and 1986, the General Electric Company (GE) owned the Powerex Facility. GE manufactured a variety of electrical components including radar equipment, printed circuit boards for high-fidelity equipment, and high-voltage semi-conductors at the Powerex Facility. In January 1986, Powerex, Inc. (Powerex), a joint venture corporation of GE, Westinghouse Electric Company and Mitsubishi Electric America Inc. purchased the Powerex Facility and continued to manufacture high voltage semi-conductors until May 1990, when the plant was closed. Solvents, including trichloroethene (TCE), were disposed of at the Powerex Facility during GE's and Powerex's operations. GE reacquired the Powerex Facility in 1990. No manufacturing operations are currently conducted at the Site.

In 1988, routine testing of the Village of Union Springs' municipal drinking water supply, conducted by the New York State Department of Health (NYSDOH), revealed low levels of two VOC's, *cis*-1,2-dichloroethene (*cis*-1,2-DCE) and TCE. In 1989, routine testing by NYSDOH of the drinking water supply at a private school, the Union Springs Academy also revealed low levels of *cis*-1,2-DCE and TCE. In 2000, NYSDEC conducted a potential VOC source area investigation, which included sampling residential water supplies. As a result of this investigation, 18 residential wells were found to be contaminated with VOCs. Distribution of the contamination indicated that the source(s) were located to the northeast of the Village of Union Springs toward the City of Auburn. In 2001, the Village of Union Springs installed an air stripper on the public water supply to remove the VOC contaminants. The Union Springs Academy well is no longer in service, and drinking water for the school is now provided by the Village of Union Springs public water supply.

Beginning in December 2000, EPA initiated a response action that included additional groundwater sampling and the installation of point-of-entry treatment systems (POETS) on private wells with contaminant levels above federal Maximum Contaminant Levels (MCLs). By April 2001, over 300 residential and private water supply wells were sampled in connection with investigations by EPA, NYSDEC, NYSDOH, and the Cayuga County Department of Health (CCDOH). As a result of these sampling events, EPA determined that 51 residential wells and three farm wells (54 total wells) were contaminated with VOCs, primarily TCE, *cis*-1,2-DCE, and vinyl chloride (VC) at concentrations above the federal MCLs. Additional residences' water supply wells were found with VOC contamination above state standards, but at concentrations less than the federal MCLs.

Beginning in the fall of 2001, the Cayuga County Water and Sewer Authority installed public water lines to reach almost all homes in the affected area within the Town of Aurelius. In 2006, the Towns of Springport and Fleming installed public water lines to the remainder of the affected area in their towns. Residences with POETS installed previously by EPA were connected to the public water supply. However, EPA continued to maintain treatment systems on four impacted properties with wells: three dual-use (agricultural/residential) wells and one residential well. The maintenance of these four properties had been conducted by EPA until this work was assumed by GE pursuant to an administrative order entered into with EPA in September 2012. The one residential property has since been connected to the public water supply and maintenance pursuant to the administrative order is conducted at the three dual-use wells. There are a limited number of residences with VOC contamination levels less than the federal and state MCLs that had POETS installed by the CCDOH with funding from the State of New York. These POETS are currently maintained by the homeowners. In addition, other residences that declined to have POETS installed were found with VOC contaminants above the state groundwater standard, but at levels below the federal MCLs.

From January 2001 through the present, several hydrological investigations and groundwater sampling events have been conducted by EPA, NYSDEC and NYSDOH, the United States Geological Survey (USGS), and CCDOH. These investigations involved the installation, hydraulic and geophysical testing, and sampling of groundwater monitoring wells and private residential wells. EPA has also reviewed studies and sampling conducted by GE pursuant to NYSDEC orders for the Powerex Facility. Under a NYSDEC Order, GE continues to sample wells installed at, and downgradient of, the Powerex Facility as part of the remedial investigation/feasibility study (RI/FS) for the Powerex Facility, which is listed on the State registry of inactive hazardous waste sites.

On September 13, 2001, EPA proposed the Site for inclusion on the National Priorities List (NPL) and on September 5, 2002, EPA placed the Site on the NPL.

EPA conducted a Remedial Investigation (RI) at the Site from 2001 through 2010. Multiple rounds of groundwater, surface water, and sediment samples were collected, resulting in an RI Report that was issued in February 2012. The RI identified that groundwater contamination occurs primarily in deep zones of the bedrock aquifer system, and is most concentrated in the gypsiferous upper portion of the Forge Hollow Unit (identified as the D3 zone in the RI Report).

VOCs, primarily TCE, *cis*-1,2-DCE, *trans*-1,2-DCE, and VC were identified as the Site-related contaminants of concern for the deep bedrock units (D1 through D6 zones).

The Powerex Facility is being addressed by GE with NYSDEC oversight under the State's superfund program. Remedial actions at the Powerex Facility are not the focus of this decision document, although successful remediation (i.e., source control or removal) of the source area(s) at the Powerex Facility is important to the full realization of the benefits of the remedy selected in this ROD. EPA has identified GE as a potentially responsible party under CERCLA for the Site. The effectiveness of the remedy will require some coordination between actions to address contaminant sources at the Powerex Facility and the remedy selected in this ROD. EPA is coordinating with NYSDEC on the source area investigation at the Powerex Facility and the remedy described in this Record of Decision. In the event that source control is not successfully implemented pursuant to New York State law, EPA may elect to evaluate additional options at the Powerex Facility pursuant to CERCLA to ensure the effectiveness of the selected remedy for the Site.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

On July 16, 2012, EPA released the Proposed Plan for cleanup of the Site to the public for comment. EPA made supporting documentation comprising the administrative record available to the public at the information repositories maintained at the Seymour Public Library in Auburn, New York and the EPA Region II Office in New York City. The notice of a public comment period and the availability of the above-referenced documents were published in the *Auburn Citizen Newspaper* and the *Syracuse Post Standard* on July 17, 2012. The public comment period, which was originally scheduled for 30 days was extended to September 17, 2013, after EPA received a request for an extension. On August 2, 2012, EPA held a public meeting at the Union Springs High School to inform officials and interested citizens about the Superfund process, to present the Proposed Plan for the Site, including the preferred remedial alternatives, and to respond to questions and comments from the attendees. Responses to the questions and comments received at the public meeting and in writing during the public comment period are included in the Responsiveness Summary. (See Appendix V)

CONSULTATION WITH THE CAYUGA NATION

In accordance with Section 126 of the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. § 9626, and pursuant to Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments, November 2000) and the EPA Policy on Consultation and Coordination with Indian Tribes (May 4, 2011), EPA is required to consult with Indian Nations when its actions or decisions may affect tribal interests. EPA commenced government-to-government consultation with the Cayuga Nation prior to issuance of the proposed plan for the Site, as the Site includes a portion of the Nation's ancestral lands, as recognized by the 1794 Treaty of Canandaigua. EPA received comments from the Cayuga Nation on the Proposed Plan and, consistently with EPA policies, engaged in further consultation prior to issuance of the ROD.

SCOPE AND ROLE OF THE RESPONSE ACTION

The response action described in this document addresses drinking water and groundwater contamination in Area 1 and Area 2 as well as drinking water in Area 3. In response to public comments, this decision document defers a decision on groundwater and surface water contamination in Area 3. EPA will conduct further investigations of the groundwater and surface water in Area 3. The primary objectives of this decision document are to restore groundwater quality in Area 1 and Area 2 at the Site to its most beneficial use as a source of drinking water, to minimize the migration of contaminants, and to minimize any potential future health and environmental impacts from the groundwater.

SUMMARY OF SITE CHARACTERISTICS

EPA collected environmental data during the RI and other sampling efforts in order to determine Site characteristics as well as gain information to perform a risk assessment. RI-related sampling of groundwater, surface water, sediment, and vapor intrusion at the Site was conducted in several phases from 2001 to 2010. For remedial planning and cost estimating purposes, the Site has been divided into three approximate areas (refer to Figure 2 in Appendix I). Area 1 consists of the impacted area immediately south of the Powerex Facility and extends approximately 700 - 900 feet south of Genesee Street. Area 2 consists of the impacted area immediately south-southwest of Area 1, and extends to the southwest of the Town of Aurelius. Area 3 consists of the impacted area immediately south and southwest of Area 2 extending to and including the village of Union Springs. This ROD addresses the contaminated groundwater in Areas 1 and 2 of the Site.

Cultural Resources

A Stage IA cultural resources survey was conducted in 2005. The purpose of the Stage IA cultural resources survey was to identify previously recorded archaeological or historic sites and to evaluate the potential for the existence of previously unrecorded archaeological or historic resources within the area that may be affected by remediation activities.

The Stage IA survey identified numerous previously recorded Native American archeological sites and burial grounds located within the Site (and immediate vicinity), particularly in the areas near Cayuga and Owasco Lakes. This is consistent with the long history of occupation and use of this area by the Cayuga Nation and the spiritual and culture importance of Cayuga Lake and its associated lands and waters to the Cayuga people. Historic maps identify the locations of nineteenth-century farms located throughout the Site, as well as residences and commercial enterprises in Auburn and Union Springs. Based on the information collected during the Stage

IA survey, the selected remedy is not anticipated to affect these properties. However, if the remedial design indicates a potential impact on cultural resources in Area 1 or Area 2, additional studies may be performed and an approach would be developed, incorporating monitoring during the remedial action, to further ensure that archeological sites within the Site would not be impacted by the remedial action.

Site Geology

The Site is located at the northern edge of the glaciated Allegheny Plateau Physiographic Province. The geology of the area is characterized by unconsolidated glacial deposits underlain by consolidated bedrock. The unconsolidated deposits consist of glaciolacustrine clay, silt, fine sand, and glacial till ranging from approximately 2 to 77 feet thick.

The bedrock units consist of a sequence of Devonian and Silurian limestone, dolostone, evaporite deposits, shale, and sandstone formations that dip gradually southward. The youngest rocks identified during borehole logging and rock coring are the lower formations of the Middle Devonian Hamilton Group (Skaneateles and Marcellus Formations) which are underlain, in descending order, by the Middle Devonian Onondaga Formation, the Lower Devonian Manlius and Rondout Formations, the Upper Silurian Cobleskill Formation, Bertie Group, and Camillus Shale. The bedrock has little primary porosity; secondary porosity such as fractures and solution voids is common. In general, the deep bedrock is more fractured and more transmissive than the shallow and intermediate bedrock. In select areas throughout the study area, USGS identified repeated stratigraphic units in some boreholes within the Marcellus, Onondaga, and Manlius Formations, most likely due to localized thrust faulting (Anderson et al. 2004; Eckhardt et al. 2011). A specific example of this thrusting occurs in wells on Pinckney Road. Where not fractured or faulted, the limestones of the Lower Onondaga Formation and the grey, interbedded limestones, dolomites, and shales of the Manlius Formation act in concert as an aquitard across portions of the study area. The four members of the Onondaga Formation include some thin interbedded bentonites and argillaceous limestones. The Onondaga Formation overlies the limestone and dolostone of the Manlius Formation (Olney Member).

The Chrysler Member of the Rondout Formation, comprised of grey interbedded dolostone and shale, underlies the Manlius. The Upper Silurian limestones of the Cobleskill Formation underlie the Rondout and overlie the dolostones of the Upper Silurian Bertie Group, comprised locally of the Oxbow, Forge Hollow, and Fiddlers Green Members. The upper portion of the Forge Hollow, typically about 15 feet thick, is gypsiferous and argillaceous, and has well-developed solution voids. The Bertie Group, which forms the lowermost units of the carbonate rock sequence, overlies the Upper Silurian shales of the Camillus Formation. The Camillus is the deepest unit observed in geologic logs during this RI.

Site Hydrogeology and Conceptual Model

Groundwater investigations at the Site have documented the presence of four hydrogeologic units consisting of the overburden, shallow bedrock (identified as units S1 through S3), intermediate bedrock (identified as units I1 and I2), and deep bedrock (identified as units D1 through D6). Contamination in the shallow aquifer underlying the Powerex Facility is being addressed by the State of New York. Pursuant to a Order on Consent, a shallow groundwater extraction and treatment system at the Powerex Facility is operated by GE with oversight by NYSDEC.

The conceptual model regarding groundwater contamination at the Site indicates that contaminants entered the overburden at the Powerex Facility, moved downward from the shallow zone, through the intermediate zone via vertical fractures or karst features and into the deep zone, and then moved laterally from the Powerex Facility and downgradient via groundwater flow, primarily in the D3 zone. Depending on the location, the D3 zone ranges from 150 to 250 feet below ground surface, is 15 to 20 feet thick, and is highly transmissive due to the development of karst solutions features. The deep groundwater contaminant plume migrates south from the Powerex Facility towards Pinckney Road, below which contains a highly fractured fault zone. From Pinckney Road, the groundwater contamination flows south-southwest to the Village of Union Springs and Cayuga Lake.

The overburden hydrogeologic unit consists of glaciolacustrine deposits of clay, silt, fine sand, and glacial till. Where present, groundwater in the overburden flows towards local surface water bodies or provides recharge to underlying bedrock units. The shallow bedrock hydrogeologic units are composed of the Upper Onondaga/Marcellus Formation (S1), the Middle Onondaga (S2), and the Lower Onondaga (S3). The Marcellus is present in the southern area of the Site and is typically 50 feet thick. The nominal thickness of the Onondaga formation at the Site is 75 feet. Data collected in the shallow bedrock shows that groundwater flow in the shallow bedrock does not flow in the same direction as the deep bedrock. Groundwater migration in the shallow bedrock is, generally, northward from the residential area south of the Powerex Facility towards the Owasco Outlet where the shallow groundwater system discharges. The shallow zones can become de-watered locally, suggesting that in some places vertical fracturing extends through the underlying intermediate zone, allowing water to drain into the deep zone. Near Overbrook Drive and Pinckney Road, the water levels from residential wells suggest that vertical fractures and low angle faults connect the shallow, intermediate and deep bedrock zones.

The intermediate bedrock zone consists of the Manlius Formation, which is typically divided into Upper Manlius (I1) and Lower Manlius (I2). At the Site, the Manlius often functions as an aquitard separating the shallow and deep aquifer units, unless it has been breached by vertical fractures. The nominal thickness of the Manlius formation at the Site is 36 feet. Groundwater flow in the Manlius Formation is to the south-southwest.

The deep bedrock is divided into six zones. The Rondout comprises the D1 zone. The Cobleskill comprises the D2 zone. The Bertie formation is divided into three zones: the D3 zone which encompasses the gypsiferous unit at the top of the Forge Hollow Unit, the D4 zone, which is the middle of the Bertie Formation, and the D5 zone at the bottom of the Bertie Formation. The D6 zone is the Camillus Shale, which is the base unit in the hydrostratigraphic system investigated in the RI. Groundwater migration in the deep bedrock is to the south. The deep bedrock aquifer receives groundwater recharge through fractures or karst features connecting the shallow and deep bedrock units. As a result, water levels in the deep bedrock can rise rapidly in response to precipitation events. The rapid rise in hydraulic head in the D3 zone can cause upward flow along vertical fractures, faults, and/or dissolutions voids, resulting in vertical mixing of the deep and intermediate zones. The combined nominal thickness of the five deep bedrock zones above the Camillus at the Site is about 200 feet, with some variations throughout the Site. The deep groundwater contaminant plume migrates south from the Powerex Facility towards Pinckney Road, below which contains a highly fractured fault zone. From Pinckney Road, the groundwater contamination flows south-southwest to the Village of Union Springs and Cayuga Lake.

Groundwater Sampling

During the RI, a total of 23 multiport groundwater monitoring wells were installed by EPA at the Site. In addition, as part of the investigation of the Powerex Facility, GE installed 32 individual screened monitoring wells in the area south of West Genesee Street. Comprehensive groundwater sampling events were conducted by EPA using all available EPA wells in July 2006, July 2007, and June 2010.

The June 2010 sampling event included groundwater samples from the GE wells. During the course of the RI, a total of 603 groundwater samples were collected from the 23 EPA monitoring wells, a total of 82 samples were collected from wells installed by GE, and 12 samples were collected from residential wells. Analytical results for these samples were compared to EPA and NYSDOH promulgated health-based MCLs, which are enforceable standards for various drinking water contaminants. Groundwater contamination exceeding applicable drinking water standards has been shown to exist within the Site, at highly elevated concentrations in some areas. The RI data indicate that groundwater contamination occurs primarily in deep zones of the bedrock aquifer system, and is most concentrated in the gypsiferous upper portion of the Forge Hollow (D3), which has a greater ability to transmit water. As groundwater flows downgradient in the D3 zone, contaminant concentrations decrease. Low concentrations of chlorinated VOCs, similar to those detected in groundwater, were detected in springs and in a creek in the Village of Union Springs.

VOCs, primarily TCE, *cis*-1,2-DCE, *trans*-1,2-DCE, and VC, were identified as the Site-related contaminants of concern in groundwater in the deep bedrock units (D1 through D6 zones). Specifically, in monitoring wells downgradient from and outside the Powerex Facility TCE was detected at levels up to 679 micrograms per liter (µg/l), *cis*-1,2-DCE was detected at levels up to 89,200 (µg/l), *trans*-1,2-DCE was detected at levels up to 1,260 µg/l, and VC at concentrations up to 5,500 µg/l.

Groundwater contaminated with VOCs extends from the Powerex Facility south to Pinckney Road and then southwest to the Village of Union Springs, a distance of approximately seven miles. As described in the Site History Section above, the Village of Union Springs public water supply wells have been affected by VOCs associated with the Powerex Facility. The highest concentrations of VOCs were consistently detected in monitoring wells located directly south of West Genesee Street and at the Powerex Facility.

Historically, groundwater samples collected from monitoring wells near the Powerex Facility consistently had high VOC concentrations, indicative of dense nonaqueous phase liquid (DNAPL)[2]. In the area between West Genesee Street and Pinckney Road, VOC contamination occurs in a relatively narrow area. The contaminant distribution observed in wells there is

[2] A dense non-aqueous phase liquid or DNAPL is a liquid that is both denser than water and is immiscible in or does not dissolve in water.

consistent with groundwater flow to the south in the deep bedrock. Further south of the Powerex Facility, along Pinckney Road, the VOC plume widens, extending to the east and west along Pinckney Road and Overbrook Drive. In the Pinckney Road area, thrust faulting has caused extensive fracturing of the bedrock. The extensive fracturing provides a pathway for groundwater to flow between the shallow, intermediate, and deep bedrock zones. South of Pinckney Road, groundwater flow in the deep bedrock is toward the southwest, in the direction of Cayuga Lake, which is the low point in the regional groundwater flow system. VOCs detected in wells in this area occur in the deep bedrock units. The overall distribution of VOCs in the southern area of the Site is consistent with groundwater flow to the southwest.

Matrix diffusion modeling was conducted using existing data collected by EPA and GE at the Site to assess the contaminant mass present within the pore spaces of the rock itself. Matrix diffusion commonly occurs in fractured rock settings, and is an important natural process that attenuates the contaminant plume migration. Dissolved-phase contaminants present in groundwater will diffuse into the rock matrix. Concentration gradient is the dominant force driving matrix diffusion. Contaminants move from areas of high concentration in groundwater within fractures toward areas of lower concentration within the rock matrix. When contaminant concentrations are reduced in groundwater within the fractures the concentration gradient is reversed and back diffusion of contaminants in the rock matrix will occur. Thus, contaminants within the rock matrix act as a secondary source of contamination to the fractured groundwater, in effect, extending the remediation cleanup timeframe. For planning and estimating purposes, the results of this analysis support the use of a 30-year timeframe to remediate groundwater, although remediation timeframes could exceed this estimate.

Surface Water and Sediments

In July 2004, dive members of EPA's Environmental Response Team conducted a reconnaissance survey of the Cayuga Lake bottom just offshore from Union Springs. The purpose of this survey was to evaluate whether groundwater discharges to the lake. As a result, dive team personnel located a significant spring discharge with visible outflow, just offshore from Union Springs in approximately 4 to 5 feet of water. A sample of water collected from the spring did not reveal any detectable concentrations of VOCs. In addition, the RI included sampling of surface water from Owasco Outlet, Crane Brook, and springs in the Village of Union Springs. Sediment samples were collected from springs and a stream in the Village of Union Springs. Contaminant concentrations were compared to screening criteria developed in the RI. No Site-related VOCs were detected in surface water collected from Owasco Outlet and Crane Brook. A number of Site-related VOCs, including TCE, PCE, *cis*-1,2-DCE, and *trans*-1,2-DCE were detected in surface water samples collected from the Village of Union Springs. Concentrations of *cis*-1,2-DCE exceeded the screening criterion of 5 µg/L in four of the nine surface water sampling locations, occurring at a maximum concentration of 18 µg/L. None of the other VOCs detected exceeded their respective screening criterion. VOCs detected in the surface water samples were similar to the VOCs that exceeded MCLs in groundwater samples. The VOCs observed in the spring and stream in Village of Union Springs suggest discharge of contaminated groundwater to the surface water bodies. No VOCs were detected in the surface water samples collected from Crane Brook and Owasco Outlet at the northern end of the Site.

Residential Well Sampling

During the RI, groundwater samples were collected from 12 selected residential wells in the area. The residential well sampling locations were selected based on the historical sampling results from the CCDOH. TCE, *cis*-1,2-DCE, and VC exceeded screening criteria in eight residential well samples. Concentrations of *cis*-1,2-DCE ranged from 2.3 *ug/l* to 440 *ug/l*, and exceeded MCLs in seven of the residential wells. TCE was detected in eight of the residential wells and exceeded MCLs in three of the residential wells. Concentrations of TCE ranged from 0.46 *ug/l* to 24 *ug/l*. *Trans*-1,2-DCE was detected in three residential wells but only exceeded MCLs in one well, at a concentration of 7.7 *ug/l*.

Vapor Intrusion

EPA investigated the soil vapor intrusion pathway at the Site. VOC vapors released from contaminated groundwater and/or soil have the potential to move through the soil and seep through cracks in basements, foundations, sewer lines, and other openings and affect the indoor air quality of overlying buildings.

In 2009, EPA conducted an investigation of vapor intrusion at 54 residences and one school at the Site by collecting subslab and indoor air data. EPA drilled through the basements floors and installed ports in order to sample the soil vapor (air) under these residences. Sampling devices called Summa canisters were attached to these ports to collect air from below building slabs at a slow flow rate over a 24-hour period. Summa canisters were also used to collect outdoor air samples to determine if there were any outdoor sources that may impact indoor air quality. The Summa canisters were then collected and sent to a laboratory for analyses. The results of the analyses indicated that the residences and school did not have concentrations of VOCs at or above EPA Region 2 and NYSDOH screening levels in sub-slab and indoor air.

Contamination Fate and Transport

Chlorinated solvents such as TCE released to the ground surface can migrate downward through the unsaturated zone in a relatively linear pattern, with minimal dispersion from the discharge location. Once a liquid chlorinated solvent such as TCE encounters the water table, the solvent will dissolve into the groundwater and move in the direction of groundwater flow. Depending on the quantity released, not all of the TCE will dissolve and it will continue moving downward under the force of gravity as a DNAPL. DNAPL has been observed in shallow overburden wells within the Powerex Facility. While the physical presence of DNAPL outside of the Powerex Facility has not been confirmed, TCE has been detected in groundwater samples in four wells, B-31D3, B-32D3, B-33D3, and B-53D3, at high concentrations which are indicative of the presence of DNAPL in the bedrock. For example, during the sampling conducted in June 2010, TCE was detected at a concentration of 473,000 μg/l in well B-31D3; at 132,000 μg/l in well B-32D3; at 20,100 μg/l in well B-33D3; and at 81,000 μg/l in well B-53D3. These wells are located on the Powerex Facility along the southern boundary adjacent to West Genesee Street. Correspondingly elevated concentrations of *cis*-1,2-DCE also exist along this portion of the study area. VOCs in the dissolved phase generally are weakly adsorbed and tend to move with groundwater flow. In highly transmissive bedrock, such as in the gypsiferous interval of the Forge Hollow Unit, VOCs can move at high rates.

In general, groundwater in the deep bedrock units flows to the south-southwest across the Site area. There is evidence that localized vertical migration pathways exist at the Site. VOCs can move vertically downward from shallow source zones into the more transmissive, deep bedrock units. In the deep bedrock, the groundwater and dissolved contaminants tend to flow along preferential flow paths, such as fractures and solution features in the rock. Fracturing and hydraulic gradients can cause upward vertical migration from the highly impacted D3 unit to shallower bedrock units. This has been observed at locations in the vicinity of Pinckney Road and Overbrook Drive. Near these locations, thrust faulting, fracturing and over pressurization of the deep bedrock units (in response to infiltration of rainfall and snowmelt) appears to have caused the migration of *cis*-1,2-DCE into shallower units. In one location, *cis*-1,2-DCE is also observed in deeper units (D4 and D5). However, the concentrations are at least two to three orders of magnitude below the highest levels observed at the Powerex Facility. Residential wells can become contaminated with VOCs if (1) they intercept the deep bedrock units or (2) they are screened across an interval where vertical mixing of deep and overlying shallower groundwater occurs. Groundwater discharge areas such as springs and streams can also be impacted by VOCs.

Surface water samples were collected in Crane Brook, Owasco Outlet, and surface water and sediment samples were collected from the springs and a stream in the Village of Union Springs to investigate the potential for VOCs to be transported by groundwater discharge to surface waters. No contaminants of concern were detected in the surface water samples collected in Crane Brook or Owasco Outlet and low concentrations of VOCs including TCE were detected in surface water samples collected from springs and the stream in the Village of Union Springs. The types of VOCs detected in surface water were similar to those detected in the Village of Union Springs public water supply. The data suggest that VOCs in groundwater are discharging to surface water in this area. No VOCs were detected in sediments collected near the Village of Union Springs.

An evaluation of natural attenuation parameters as part of the RI suggests the conditions in parts of the aquifer are conducive to reductive dechlorination of VOCs. The data suggests that reductive dechlorination of TCE is occurring at the Powerex Facility, and in areas immediately downgradient, such as in Area 1, where geochemical conditions are suitable. Degradation products of TCE, including *cis*-1,2-DCE and *trans*-1,2-DCE, were commonly detected in groundwater samples collected in downgradient areas. The data further suggests that TCE degradation products migrate downgradient with significant degradation until the daughter products are formed. The degree and extent of subsequent reductive dechlorination of the DCE isomers is uncertain, although daughter products such as VC, ethene, and ethane were detected in some wells including some residential wells downgradient of Pinckney Road, which is located within Area 2.

Additionally, multiple lines of evidence indicate that a suite of indigenous bacteria capable of complete reductive chlorination of the contaminants of concern are present in the aquifer underlying the Powerex Facility. Abiotic degradation of TCE has also been confirmed in this area. In 2011, GE performed a bench-scale microcosm study to investigate abiotic degradation of TCE in groundwater through the addition of iron sulfides in the strata underlying the Powerex Facility. The study results suggest that abiotic degradation is occurring in the aquifer and is contributing to the natural attenuation of TCE and *cis*-1,2-DCE observed in groundwater. A follow-up microcosm study to assess the presence of abiotic degradation in the D3 zone was conducted by GE in 2012. The study further revealed that a large amount of natural attenuation was found to be due to biotic degradation. The testing demonstrated that both biotic degradation and abiotic degradation are contributing to natural attenuation of TCE in the aquifer.

However, natural attenuation processes that reduce contaminant concentrations in groundwater by destructive mechanisms such as biodegradation and chemical reactions with other subsurface constituents appear to be dominant at or immediately downgradient of the Powerex Facility. The highest concentrations of TCE occur at locations closest to the Powerex Facility. Most of the contaminants observed outside the facility occur as daughter or biodegradation products of TCE, which are primarily *cis*-1,2-DCE and vinyl chloride. Furthermore, these contaminants are present at much lower concentrations (orders of magnitude lower) in Areas 1, 2 and 3 as compared to the concentrations at the Powerex Facility. Other contaminants, such as methanol, acetone, and petroleum-related compounds, which are present in groundwater at the Powerex Facility are absent in downgradient wells. These compounds are being used as electron donors (substrate) by indigenous bacteria in the aquifer in the process of degrading the TCE.

The results of the RI suggest that the groundwater plume is stable. With regards to contaminant concentrations in Area 2, the data indicates, in some instances, decreasing concentrations of contaminants. In downgradient areas, such as Area 2 and Area 3, relatively low concentrations of TCE are co-located with higher concentrations of the degradation product *cis*-1,2-DCE and the presence of additional TCE degradation products such as *trans*-1,2-DCE, VC, ethene, and ethane, suggests that degradation of TCE is occurring. Additionally, D3 wells with the highest VC concentrations have elevated concentrations of ethene and ethane suggesting that anaerobic reductive dechlorination has occurred and is likely continuing. Although, VC and ethane are present in some wells, *cis*-1,2-DCE is the primary VOC present in many of the downgradient and residential wells sampled. This suggests that conditions in the downgradient area do not support reductive dechlorination of the chlorinated VOCs. Nondestructive mechanisms such as dilution, dispersion, and diffusion appear to be the dominant natural attenuation mechanisms further downgradient of the Powerex Facility. However, since a cleanup decision for Area 3 is being deferred, further investigation of the natural attenuation processes in this area will be performed.

Source Investigation

Based on the hydrogeologic data, groundwater flow data, contaminant distribution data collected during the RI, and previous investigations including groundwater investigations and sampling conducted by GE, the Powerex Facility is the major source of the VOC contamination observed in groundwater at the Site.

The Powerex Facility consists of 55.4 acres of land located on West Genesee Street on the boundary of the Town of Aurelius and the City of Auburn. GE purchased the property in 1951 and operated a manufacturing plant where electric components, including radar equipment, printed circuit boards, and high-voltage semi-conductors were manufactured. In January 1986, the property was acquired by Powerex, Inc., a joint venture of Westinghouse Electric Corporation, Mitsubishi Electric America, Inc. and GE. Powerex continued to manufacture high voltage semi-conductors until May 1990, when the plant was closed. No manufacturing operations are currently conducted at the Site. GE reacquired the Powerex Facility in 1990.

On March 31, 1993, NYSDEC and GE entered into an Order on Consent to perform an RI/FS under state law for the Powerex Facility, which is listed on the State registry of inactive hazardous waste sites. The RI/FS is currently in progress. Three Interim Remedial Measures (IRMs) have also been performed under the Order on Consent. The first IRM, conducted in February 1994, included the excavation and removal of two laboratory waste solvent tanks and their contents. The second IRM involved the installation of additional fencing and gates to restrict access at the Powerex Facility. This work was completed in December 1994. The third IRM focused on addressing surface water and groundwater in the shallow bedrock source areas at the Powerex Facility, including pre-design investigation activities and a pilot test for the use of a dual-phase extraction technology. Pursuant to an Interim Action ROD issued by NYSDEC in March 1996 under state law and an Amended Order on Consent executed on May 12, 1997, GE constructed a shallow groundwater extraction and treatment system at the Powerex Facility. Operation of that system commenced on May 15, 2001. The system consists of 12 extraction wells in and near source areas on the Powerex Facility and one off-facility extraction well.

To date, the system has treated over 60 million gallons of groundwater and removed over 100,000 pounds of VOCs from the groundwater. The system serves to contain contaminants in the shallow bedrock underlying the Powerex Facility. However, concentrations of contaminants in the extraction area still remain high.

With regard to other potential sources of the contamination at the Site, the RI/FS did not identify any other major sources of the contamination. EPA's investigation of other sources included collecting hydrogeological and monitoring well information, sending information requests to certain parties, and reviewing regulatory files. Suspected potential sources other than the Powerex Facility were ruled out from further consideration based on available information.

CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

The Site area reflects the generally rural character of Cayuga County, and consists of residential neighborhoods intermingled with extensive farmland and parcels of woodlands, as well as commercial/industrial land. Historically, private wells were used to meet domestic and agricultural water supply needs. Currently, the Auburn public water system extends to the Towns of Aurelius, Fleming, and Springport. The Village of Union Springs uses groundwater from two municipal wells to supply the domestic water needs of residents. Currently the Village of Union Springs treats groundwater from the municipal supply wells to remove VOCs before it is sent to the distribution systems. The majority of wells with VOC concentrations exceeding drinking water standards have been connected to the public water supply systems. Residences with POETS installed previously by EPA were connected to the public water supply. However, EPA continued to maintain treatment systems on four impacted properties with wells: three dual-use (agricultural/residential) wells and one residential well. The maintenance of these four properties had been conducted by EPA until this work was assumed by GE pursuant to an administrative order entered into with EPA in September 2012. The one residential property has since been connected to the public water supply and maintenance pursuant to the administrative order is conducted at the three dual-use wells. There are a limited number of residences with VOC contamination levels less than the federal and state MCLs that had POETS installed by the CCDOH with funding from the State of New York. These units are currently maintained by the homeowners. In addition, other residences that declined to have POETS installed have VOC contamination above the state groundwater standard, but at levels below the federal MCLs.

The Site includes a portion of the Nation's ancestral lands, as recognized by the 1794 Treaty of Canandaigua. The Cayuga Lake has been and continues to be used for recreational purposes and it is considered a valuable resource by the Cayuga Nation.

SUMMARY OF SITE RISKS

A risk assessment is an analysis of the potential adverse effects to human health and to the environment caused by the release of hazardous substances from a site in the absence of any actions to control or mitigate the release under current and anticipated future lands uses. EPA's risk assessment for this Site, which was part of the 2012 RI and FS reports, focused on contaminants in the groundwater which were likely to pose significant risks to human health and the environment. The risk assessments include a Human Health Risk Assessment (HHRA) and a Screening-Level Ecological Risk Assessment (SLERA).

The Site area is a mix of residential, commercial and farmland properties, and future use is expected to remain consistent with current zoning. In addition, although groundwater is not used as a potable water supply, for most of the Site area, its designation by the State as a Class GA aquifer requires groundwater to be considered for use as a future potable water supply. Therefore, the HHRA focused on health effects of potential future exposure to groundwater.

The HHRA Report and the SLERA Report, prepared by CDM Smith for EPA, dated May 10, 2011 and March 25, 2011, respectively, are available in the Administrative Record.

Human Health Risk Assessment

A Superfund baseline HHRA is an analysis of the potential adverse health effects caused by hazardous substance exposure from a site in the absence of any actions to control or mitigate the release under current and future land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard identification: In this step, the contaminants of potential concern (COPCs) at the Site in various media (i.e., soil, groundwater, surface water, sediment, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include ingestion of and dermal contact with contaminated groundwater and inhalation of vapor released from groundwater. Factors relating to the exposure assessment include, but are not limited to, the concentrations to which people may be exposed and the potential frequency and duration of exposure. Using these factors, a reasonable maximum exposure scenario, which reflects the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with contaminant exposures and the relationship between magnitude of exposure and severity of adverse health effects are determined. Potential health effects are contaminant-specific and may include the risks of developing cancer over a lifetime or other non-cancer health effects, such as changes in the normal functions of organs within the body (e.g., changes in the effectiveness of immune system). Some contaminants are capable of causing both cancer and non-cancer health effects.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as probability. For example, an excess lifetime cancer risk of 1×10^{-4} means an individual having a 1 in 10,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer the individual faces from other causes. Current Superfund guidelines for acceptable risks are an individual lifetime site-related excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to one-in-a-million excess cancer risk) with 10^{-6} (or a 1 in 1,000,000 chance of developing cancer) being the point of departure. For non-cancer health effects, a hazard index (HI) is calculated. An HI represents the sum of the hazard quotients compared to their corresponding reference doses or reference concentrations. The key concept for non-cancer HI is that a "threshold level" (measured as an HI of less than or equal to 1) exists below which non-cancer health effects are not expected to occur.

The cancer risk and non-cancer health hazard estimates in the HHRA are based on reasonable maximum exposure scenarios and were developed by taking into account various health protective estimates about the frequency and duration of an individual's exposure to chemicals selected as COPCs, as well as the toxicity of the contaminants.

The baseline risk assessment began by selecting COPCs in the various media that would be representative of Site risks. The media evaluated as part of the HHRA included groundwater, surface water and sediment. Groundwater at the Site is designated by NYSDEC as a potable water supply. The COPCs for the Site groundwater are *cis*-1,2-DCE, *trans*-1,2-DCE, TCE, and VC. The COPCs for surface water are bromodichloromethane, *cis*-1,2-DCE, and PCE. No COPCs were identified for sediment.

The baseline risk assessment evaluated health effects that could result from exposure to contaminated groundwater and surface water through use of groundwater for potable purposes and wading in Site waterways. Exposure pathways included ingestion of and dermal contact with groundwater, inhalation of vapors in the bathroom during bathing or showering, and incidental ingestions of and dermal contact with surface water and sediment during wading. In addition, potential effects from indoor air vapor intrusion were also evaluated. Based on the current zoning and anticipated future use, the risk assessment focused on a variety of possible receptors, including current and future recreational users, future residents, and future commercial workers. However, consistent with the anticipated future use of the Site, the receptors most likely to be in contact with media impacted by site-related contamination, e.g., groundwater, were primarily considered when weighing possible remedies for the Site.

These potential receptors include the current and future recreational users at Union Springs, Owasco Outlet and Crane Brook, and future residents and future commercial workers. A complete discussion of the exposure pathways and estimates of risk can be found in the *Human Health Risk Assessment* for the Site in the Administrative Record located in the information repository.

A vapor intrusion screening evaluation indicated the potential for VOCs in groundwater to migrate into buildings in the areas along and south of West Genesee Street, in the vicinity of Pinckney Road, and at potential groundwater discharge areas in Union Springs. In 2009, EPA conducted an investigation of vapor intrusion into structures within the area by collecting sub slab and indoor air data. EPA evaluated the vapor intrusion data collected in 2009 and determined that there was no unacceptable risk from vapor intrusion into homes and a school that were tested. EPA determined that additional vapor intrusion investigations were not necessary as there was no unacceptable risk in the homes and the school that were tested.

EPA's statistical analysis of groundwater sampling data found that the 95 percent upper confidence limits on the mean concentration of *cis*-1,2-DCE, *trans*-1,2-DCE, TCE, and VC in the groundwater were 1,459 µg/l, 26 µg/l, 11 µg/l, and 71 µg/l, respectively. All of these COPCs were detected in the groundwater in excess of federal Safe Drinking Water Act MCLs of 70 µg/l, 100 µg/l, 5 µg/l, and 2 µg/l, respectively. These concentrations also exceed the NYSDOH MCLs, which are 5 µg/l for *cis*-1,2-DCE, *trans*-1,2-DCE, and TCE, and 2 µg/l for VC. These concentrations are associated with an excess lifetime cancer risk of 2×10^{-4} for the future Site worker, 5×10^{-4} for the future adult resident, and 4×10^{-3} for the future child resident. The calculated non-cancer HIs are: future Site worker HI=7, future adult resident HI=21, and future child resident HI=51. Cancer risk and non-cancer health hazards to current and future recreational users were below EPA's acceptable risk threshold of 10^{-4} to 10^{-6} for cancer risk and HI of 1 for non-cancer health hazard.

These cancer risks and non-cancer health hazards indicate that there is significant potential risk to potentially exposed future populations from direct exposure to groundwater. For these receptors, exposure to groundwater results in either an excess lifetime cancer risk that exceeds EPA's target risk range of 10^{-4} to 10^{-6} or an HI above the acceptable level of 1, or both. The chemical in groundwater that contributes most significantly to the cancer risk and non-cancer hazard is VC.

A summary of the COCs and groundwater exposure point concentrations is listed in Appendix II, Table 1. Table 2 in Appendix II describes the selection of exposure pathways, potential receptors, and exposure scenarios. The non-cancer and cancer toxicity data summaries for the groundwater COCs are presented in Appendix II, Tables 3 and 4. Non-cancer and cancer risk characterization summaries for the groundwater COCs are presented in Appendix II, Tables 5 and 6.

Ecological Risk Assessment

A SLERA was conducted to evaluate the potential for ecological effects from exposure to surface water and sediment. Surface water and sediment concentrations were compared to ecological screening values as an indicator of the potential for adverse effects to ecological receptors. The SLERA focused on identifying potential environmental risks associated with aquatic environments present at the Site. The SLERA focused on impacts of contaminants in surface water and sediment from three water bodies: Owasco Outlet, Crane Brook, and springs and streams in Union Springs. The primary risk scenarios for aquatic organisms considered were from direct contact with, and ingestion of, contaminated surface water and sediment. A comparison of maximum concentrations of contaminants detected in Site surface water and sediment to literature-based ecological screening levels (ESLs) indicate no risks to ecological receptors. Thus, no COCs were identified for surface water or sediment. Based on the results of the SLERA, concentrations of contaminants detected in surface water and sediment at the Site are unlikely to pose any unacceptable risks to aquatic or terrestrial ecological receptors at the Site.

Uncertainties in the Risk Assessment

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include the following: environmental chemistry sampling and analysis; environmental parameter measurement; fate and transport modeling; exposure parameter estimation; and toxicology data. Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals as to the actual levels present. Environmental chemistry-analysis error can stem from several sources, including the errors inherent in the analytical methods and characteristics of the matrix being analyzed.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the COPCs, the period of time over which such exposure would occur, and the fate and transport models used to estimate the concentrations of the COCs at the point of exposure.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposures, as well as from the difficulties in assessing the toxicity of a mixture of chemicals.

All of the uncertainties identified above are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the risk assessment provides upper-bound estimates of the risks to potentially exposed populations, and it is highly unlikely to underestimate actual risks related to the Site. An estimate of central tendency risk can be obtained by substituting average or median values for upper bound values. This is most useful for the exposure pathway which results in the highest estimated carcinogenic risk, i.e., groundwater ingestion.

More specific information concerning risks, including a quantitative evaluation of the degree of risk associated with various exposure pathways, is presented in the both risk assessment reports.

Data Evaluation Uncertainty

The purpose of data evaluation is to determine which constituents, if any, are present at the Site at concentrations requiring evaluation in the risk assessments. Uncertainty with respect to data evaluation can arise from many sources, such as the quality of data used to characterize a Site and the process used to select COPCs included in the risk assessment.

Exposure Assessment Uncertainty

The most common uncertainties associated with exposure assessment includes: 1) estimation of exposure point concentrations, especially for datasets with large portion of non-detected values; 2) exposure parameters used to estimate chemical intake, such as water ingestion rate and exposure frequency.

Toxicity Assessment Uncertainty

The most common uncertainties related to toxicity assessment includes using: 1) dose-response information from animal studies to predict effects in humans; and 2) dose-response information for effects observed at elevated doses to predict adverse effects following exposure at low levels. As of the time the HHRA was prepared, EPA had not finalized toxicity values for TCE. Therefore, toxicity values from California/EPA were used in the HHRA.

Summary of Human Health and Ecological Risks

The results of the HHRA indicate that the contaminated groundwater presents an unacceptable human health exposure risk for future groundwater users. The SLERA indicated that the Site does not pose any unacceptable risks to aquatic or terrestrial ecological receptors.

Basis for Action

Based upon the results of the RI, the HHRA and SLERA, EPA has determined that the response action selected in this ROD is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered (TBC) standards, criteria, guideline, and other guidelines, and Site-specific risk-based levels.

The following RAOs for contaminated groundwater and drinking water will address the human health risks and environmental concerns:

- Reduce or eliminate exposure (via ingestion and dermal contact) to VOCs in groundwater at concentrations in excess of federal MCLs and state standards;

- Restore the impacted aquifer to its most beneficial use as a source of drinking water by reducing contaminant levels to the federal MCLs and state standards; and,

- Reduce or eliminate the potential for continued migration of contaminants towards the Village of Union Springs public water supply wells.

The cleanup levels for the groundwater COCs and their basis are presented in Table 7.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA §121(b)(1), 42 U.S.C. §9621(b)(1), mandates that remedial actions must be protective of human health and the environment, cost-effective, comply with ARARs, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a Site. CERCLA §121(d), 42 U.S.C. §9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA §121(d)(4), 42 U.S.C. §9621(d)(4).

Remedial alternatives for the Cayuga County Groundwater Contamination Site are summarized in this section. Detailed descriptions of the remedial alternatives for addressing the contamination associated with the Site can be found in the Feasibility Study (FS) Report. The FS Report presents a total of four groundwater treatment alternatives, which are presented in Areas 1 and 2, including a no action alternative. The No Action Alternative is considered in accordance with the NCP requirements and provides a baseline for comparison with the other alternatives.

The construction time for each alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy, negotiate the performance of the remedy with any potentially responsible parties, or procure contracts for design and construction.

Remediation Areas

The Site extends from the City of Auburn to the Village of Union Springs, a distance of approximately seven miles. Since the concentration of contaminants in groundwater significantly decreases with distance from the Powerex Facility towards the Village of Union Springs, the remedial alternatives developed in the FS are categorized by Site areas and are based on the level of impacts and the type of remedial technologies that may be used to address a given area of the Site. For remedial planning and cost estimating purposes, the Site has been divided into three approximate areas (refer to Figure 2 in Appendix I).

Area 1 consists of the impacted area immediately south of the Powerex Facility and extends approximately 700 to 900 feet south of West Genesee Street. In Area 1, *cis*-1,2-DCE was detected at a maximum concentration of 89,200 µg/l, TCE was detected at a maximum concentration of 679 µg/l, *trans*-1,2-DCE was detected at a maximum concentration of 1,260 µg/l, and the maximum detected concentration of VC was 5,500 µg/l.

Area 2 consists of the impacted area immediately south-southwest of Area 1, and extends to the southwest to the Town of Aurelius. In Area 2, concentrations of *cis*-1,2-DCE in residential wells were generally less than 500 µg/l, concentrations of TCE were generally less than 70 µg/l, concentrations of *trans*-1,2-DCE were less than 20 µg/l, and VC was not detected. In general, the highest concentrations of contaminants detected in Area 2 groundwater are approximately 100 times less than the highest groundwater concentrations detected in Area 1.

Area 3 consists of the impacted area immediately south and southwest of Area 2 extending to and including Union Springs. Historically, concentrations of *cis*-1,2-DCE in residential wells were generally less than 500 µg/l, concentrations of TCE were generally less than 70 µg/l, concentrations of *trans*-1,2-DCE were generally less than 10 µg/l, and concentrations of VC were generally less than 40 µg/l. The more recent sampling of the three permanent groundwater monitoring wells in Area 3, installed by EPA as part of the RI, revealed VOC concentrations below federal MCLs and state standards. In addition, recent sampling of the influent water at the two Village of Union Springs' municipal drinking water supply wells detected *cis*-1,2-DCE at concentrations below the federal MCL of 70 µg/l, but above the state standard of 5 µg/l. TCE concentrations are below federal and state standards. Nevertheless, certain private wells continue to exceed federal MCLs or state standards in Area 3. The public water supply wells in Union Springs have VOCs exceeding federal MCLs and state standards. The Village of Union Springs operates a treatment system to remove the VOCs prior to distribution to the public. A decision on the cleanup for Area 3 has been deferred and EPA will conduct further investigations of the groundwater and surface water in Area 3.

DESCRIPTION OF ALTERNATIVES

The screening process conducted as part of the FS evaluated a wide range of technologies to remediate the contaminated groundwater at the Site. As part of this process, some technologies were eliminated from detailed evaluation for certain areas. EPA conducted a detailed evaluation of No Action, groundwater pump and treat, and enhanced in-situ biological and abiotic remediation for Area 1, No Action, enhanced in-situ biological and abiotic remediation and monitored natural attenuation (MNA) for Area 2.

MNA was not evaluated to remediate Area 1 since groundwater contamination concentrations are considered too high to be able to achieve the RAOs with MNA alone. Groundwater pump and treat was not evaluated to remediate Area 2 since pumping in Area 2 would have to address a diffuse contaminant plume dispersed over a very large area and would have the potential to enhance plume migration.

As detailed in the FS Report, the development of the alternatives for each area assumed that source areas at the Powerex Facility with high contaminant concentrations would be controlled effectively by remedial activities undertaken by GE with NYSDEC oversight.

Common Elements

All of the action alternatives include the following key components.

Institutional controls would be implemented to help control and limit exposure to hazardous substances at the Site. The objectives of institutional controls would be to limit exposure to VOCs in groundwater by preventing the installation of new drinking water wells within contaminated areas. The types of institutional controls which would be employed for the groundwater at the Site are any local laws that limit installation of drinking water wells without a permit and informational devices such as advisories published in newspapers and periodic letters sent to local government authorities informing them of the need to prevent well installation to limit exposure to contaminated groundwater. In implementing the institutional controls called for in the ROD, EPA anticipates the development of an Institutional Controls Implementation Action Plan which would specify institutional controls to insure that the remedy is protective. This will include periodic publication of informational advisories and may include inspection of local and/or county Health Department records to insure that no wells are installed in the vicinity of or at the Site that could impact the groundwater plume or result in exposure to contaminated groundwater.

All action alternatives also would require the connection of impacted residences to municipal water for their future potable water needs, including any current or new residences impacted by the Site. Existing groundwater treatment systems at three dairy farms will be maintained, as necessary, or connected to the public water system. POETS will be provided, as necessary, and maintained until the connection to the public water supply is completed.

Each alternative also includes measures to ensure that the Village of Union Springs public water supply treatment system is adequately equipped to protect users of its supply from Site-related contamination. While the wellhead treatment system was upgraded independently by the Village of Union Springs in 2001 to treat Site-related contamination that had impacted the supply wells, additional measures need to be implemented to ensure that the system is capable of continuously distributing water that does not exceed drinking water standards for the Site-related contaminants. A backup generator would be provided to power the air stripper during power outages, and a second air stripper (or other comparable system/equipment) would be put in place to ensure that operations are not interrupted.

All of the action alternatives include, as part of operation and maintenance (O&M), long-term monitoring of the groundwater to determine contaminant concentrations and migration and assess the effectiveness of the remedial action.

Alternative 1: No Action (Considered for Areas 1 and 2)

The NCP requires that a “No Action” alternative be developed as a baseline for comparing other remedial alternatives. Under this alternative, there would be no remedial actions conducted at the Site to control or remove groundwater contaminants. This alternative does not include monitoring or the informational institutional controls. Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years. If justified by the review, additional response actions may be implemented.

Capital Cost:	*$0*
Annual Operation and maintenance Costs:	$*0*
Present-Worth Cost:	$*0*
Construction Time:	Not Applicable

Alternative 2: Groundwater Pump and Treat (Considered for Area 1 only)

This remedial alternative consists of the extraction of groundwater via pumping wells and treatment prior to disposal. Groundwater is pumped to remove contaminant mass from areas of the aquifer with elevated concentrations of contaminants. For this conceptual design, it is estimated that groundwater extraction wells would be installed in the D3 zone of the aquifer in Area 1. A treatment plant with a capacity of approximately 400 gpm would be constructed within or near the Site to achieve the RAOs. Extracted groundwater with VOC contamination would be treated by air stripping. Air stripper effluent may be treated with a thermal oxidizer system, in accordance with federal and State regulations prior to being discharged into the atmosphere, if necessary. Due to the variation in hydraulic and hydrogeologic properties, as well as the contaminant concentrations, during the remedial design, pilot studies and performance tests will be conducted to determine the number and location of extraction wells needed to ensure that the required RAOs are achieved. During the remedial design, a determination will also be made either to discharge treated extracted groundwater to surface water or to reinject it to groundwater.

Capital Cost:	$20.05 Million
Annual O&M Costs:	$2.81 Million
Present-Worth Cost:	$53.8 Million
Construction Time:	24 months

Alternative 3: Enhanced In-Situ Biological and Abiotic Remediation (Considered for Area 1 and Area 2)

Enhanced in-situ biological and abiotic remediation involves the injection of an electron donor, nutrients, dechlorinating microorganisms (i.e., bioaugmentation), and/or other chemicals into the groundwater at the impacted depths using an extraction-reinjection well network. Once delivered, these chemicals promote reductive dechlorination, a process used to describe the degradation of VOCs.

There are several different in-situ treatment process options that are potentially applicable under this alternative, including Enhanced Anaerobic Bioremediation (EAB) and Biogeochemical Transformation (BT). Four different in-situ treatment process options were considered under this alternative:

1. Option A: In-situ EAB with lactate
2. Option B: In-situ EAB with emulsified vegetable oil
3. Option C: In-situ EAB with whey
4. Option D: In-situ biogeochemical transformation

EAB is the process of adding a carbon source as an electron donor, which would promote the biological reductive dechlorination of VOCs by microorganisms in the subsurface. Lactate, emulsified vegetable oil (EVO), and whey are examples of carbon sources used to promote the biodegradation of chlorinated solvents by naturally occurring microorganisms called *Dehalococcoides sp*.

BT degrades chlorinated solvents though a combination of biological and abiotic (i.e., not dependent on microorganisms) processes. This process involves the addition of a carbon source (such as lactate, EVO, or others) along with a source of iron and/or sulfate to promote both biotic and abiotic reductive dechlorination processes.

The FS evaluated each of these process options. The estimated cost of this alternative is contingent upon numerous factors, such as the injection material, dosage requirements and number of subsequent injections. Further evaluation during the remedial design would be conducted to determine the specific process option (i.e. carbon source) or combination of process options to be implemented. A pilot study would be required to assess treatment effectiveness. During the remedial design, further evaluation would be conducted to determine the effective number and location of the injection well network in delivering the agents into the subsurface. It is anticipated that repeated injections may be necessary.

Area 1

Capital Cost:

Option A: $21.22 Million
Option B: $22.40 Million
Option C: $19.89 Million
Option D: $16.29 Million

Present-Worth Costs:

Option A: $23.25 Million
Option B: $24.44 Million
Option C: $21.92 Million
Option D: $18.32 Million

Annual O&M Costs: $163,300
Construction Time: 24 months

Area 2

Capital Cost:

Option A: $18.65 Million
Option B: $17.81 Million
Option C: $17.48 Million
Option D: $10.36 Million

Present-Worth Costs:

Option A: $20.68 Million
Option B: $19.84 Million
Option C: $19.51 Million
Option D: $12.39 Million

Annual O&M Costs: $163,300
Construction Time: 24 months

Alternative 4: Monitored Natural Attenuation (MNA) (Considered for Area 2)

This remedial alternative relies on monitored natural attenuation to address the groundwater contamination. Natural attenuation is the process by which contaminant concentrations are reduced by various naturally occurring physical, chemical, and biological processes. The main processes include biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biological stabilization, transformation, or destruction of contaminants. These processes occur naturally, in-situ, and act to decrease the mass or concentration of contaminants in the subsurface. Only non-augmented natural processes are relied upon under this alternative. Augmentation through addition of electron acceptors or nutrients is considered an in-situ technology. The effectiveness of this alternative in Area 2 depends on the effectiveness of the alternative implemented in Area 1 in preventing downgradient migration of contamination. Implementation of this alternative includes the installation of additional monitoring wells, periodic sample collection and analysis, data evaluation, and contaminant concentration trend analysis.

<u>Area 2</u>

Capital Cost:	$246,000
Annual O&M Costs:	$134,000
Present-Worth Cost:	$1.91 Million
Construction Time:	2 months

COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting a remedy, EPA considers the factors set out in CERCLA Section 121, 42 U.S.C. Section 9621, by conducting a detailed analysis of the viable remedial alternatives in accordance with the NCP, 40 CFR Section 300.430(e)(9)(iii) and Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-01. The detailed analysis consists of an assessment of each alternative against each of nine evaluation criteria and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

The following "threshold" criteria are the most important and must be satisfied by any alternative in order to be eligible for selection:

1. *Overall protection of human health and the environment* addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. *Compliance with ARARs* addresses whether or not a remedy would meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and regulations or provide grounds for invoking a waiver. Other federal or state advisories, criteria, or guidance are TBCs. TBCs are not required by the NCP, but the NCP recognizes that they may be very useful in determining what is protective of a site or how to carry out certain actions or requirements.

The following "primary balancing" criteria are used to make comparisons and to identify the major tradeoffs between alternatives:

3. *Long-term effectiveness and permanence* refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

4. *Reduction of toxicity, mobility, or volume through treatment* is the anticipated performance of the treatment technologies, with respect to these parameters, a remedy may employ.

5. *Short-term effectiveness* addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup levels are achieved.

6. *Implementability* is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. *Cost* includes estimated capital, O&M, and present worth costs.

The following "modifying" criteria are used in the final evaluation of the remedial alternatives after the formal comment period, and may prompt modification of the preferred remedy that was presented in the Proposed Plan:

8. *State acceptance* indicates whether, based on its review of the RI/FS report, Human Health and Ecological Risk Assessment, and Proposed Plan, the State concurs with, opposes, or has no comments on the selected remedy.

9. *Community acceptance* refers to the public's general response to the alternatives described in the RI/FS report, Human Health and Ecological Risk Assessment, and Proposed Plan.

A comparative analysis of the alternatives considered in this ROD, based upon the evaluation criteria noted above, follows.

1. Overall Protection of Human Health and the Environment

Area 1 (Alternatives 1, 2 and 3)

Alternative 1 (No Action) is not protective of human health and the environment because it would not meet RAOs in Area 1 within a reasonable timeframe. Alternative 2 (Pump and Treat) and Alternative 3 (Enhanced Biological and Abiotic Remediation) are active remedies that both would restore groundwater quality over the long-term in Area 1 and thus would be protective of human health and the environment. These alternatives would achieve protectiveness by reducing contaminant concentrations in groundwater and limiting exposure to residual contaminants through the implementation of governmental and informational institutional controls. Alternatives 2 and 3 assume the control of contaminant migration from the Powerex Facility. Alternative 2 would be protective in Area 1 through reducing contaminant concentrations to below MCLs via extraction and treatment of groundwater. Protectiveness under Alternative 3 would be achieved in Area 1 through reducing contaminant concentrations in-situ via injection of materials to facilitate the degradation of contaminants, although there is some uncertainty as to the ability of Alternative 3 to achieve MCLs as compared to Alternative 2. A long-term monitoring program for groundwater would assess the migration and fate of the contaminants and ensure that human health is protected. Combined with long-term monitoring and institutional controls, Alternatives 2 and 3 would be expected to meet the RAOs in this Area.

Area 2 (Alternatives 1, 3, and 4)

Alternative 1 (No Action) is not protective of human health and the environment because it would not meet RAOs in Area 2 within a reasonable timeframe. Alternative 3 (Enhanced Biological and Abiotic Remediation) is an active remedy that would be expected to restore the groundwater to MCLs in Area 2 over the long-term. Alternative 4 would provide protectiveness of human health and the environment by relying on natural processes to restore groundwater to below MCLs. As to Area 2, Alternatives 3 and 4 would achieve overall protectiveness when combined with alternatives that achieve protectiveness for Area 1. These alternatives would achieve protectiveness by reducing contaminant concentrations in groundwater and limiting exposure to residual contaminants through the implementation of governmental and informational institutional controls. Alternatives 3 and 4 assume the control of contaminant migration from the Powerex Facility. Alternative 3 would be protective in Area 2 through reducing contaminant concentrations via injections. Alternative 4 would achieve protection through naturally occurring processes, although there is some uncertainty as to the ability of Alternative 4 to achieve MCLs as compared to Alternative 3 in this Area. A long-term monitoring program for groundwater would assess the migration and fate of the contaminants and ensure that human health is protected. Combined with long-term monitoring and institutional controls, Alternatives 3 and 4 would meet the RAOs in this Area.

2. Compliance with applicable or relevant and appropriate requirements (ARARs)

EPA and NYSDOH have promulgated health-based, protective MCLs (40 CFR Part 141, and 10 NYCRR Chapter 5, respectively), which are enforceable standards for various drinking water contaminants (chemical-specific ARARs). The aquifer is classified by NYSDEC as Class GA (6 NYCRR 701.18), meaning that it is designated as a potable water supply. NYSDEC also has established groundwater standards at 6 NYCRR Part 703 which are applicable. The more stringent of the federal MCL and state Standard will be the groundwater cleanup standard for the Site. Although the groundwater at the Site is not presently being utilized as a potable water source for most of the Site area, the MCLs for groundwater are applicable or relevant and appropriate requirements because the groundwater is a potential source of drinking water. More details and the full list of chemical-, action-, and location-specific ARARs, TBCs and other guidelines are available in Tables 8-a through 8-c.

Area 1

Alternative 1 (No Action) would not comply with chemical-specific ARARs. Alternative 3 would be expected to reach chemical-specific ARARs sooner than Alternative 2. However, a pilot study would need to be undertaken for Alternative 3 to further assess specific remediation timeframes. Alternatives 2 and 3 would comply with location- and action-specific ARARs.

Area 2

Alternative 1 (No Action) would not comply with chemical-specific ARARs. In Area 2, Alternative 3 would potentially reach ARARs sooner than Alternative 4. Alternatives 3 and 4 would comply with location- and action-specific ARARs.

3. Long-Term Effectiveness and Permanence

Area 1

Alternative 1 would not provide long-term effectiveness and permanence since no action would be taken. Groundwater extraction and treatment under Alternative 2 would be an effective long-term technology for treatment of contaminated groundwater, if designed and constructed properly. As discussed previously, the Powerex Facility is the major source of groundwater contamination. The design of an extraction system to remediate the groundwater contamination in the D3 zone would need to ensure that the potential for increased drawdown of contamination to the deeper bedrock intervals from the Powerex Facility is addressed. Enhanced in-situ biological and abiotic remediation under Alternative 3 would be similarly effective over the long-term for groundwater treatment for VOCs in this area, although, there is some uncertainty that in-situ biological and abiotic remediation would be ultimately be effective in achieving MCLs. At the Powerex Facility, a bench-scale pilot study was conducted in 2011 that demonstrated the potential effectiveness of the biogeochemical transformation technology. In the event that contamination at the Powerex Facility is not effectively addressed, additional remedial measures at the Powerex Facility would need to be evaluated by EPA to ensure long-term effectiveness and permanence in Area 1.

Area 2

Alternative 1 would not provide long-term effectiveness and permanence since no action would be taken. Enhanced in-situ biological and abiotic remediation under Alternative 3 has been demonstrated to be effective and reliable at numerous sites for treatment of VOCs in groundwater under conditions similar to those at the Site. At the Powerex Facility, a bench-scale pilot study was conducted in 2011 that demonstrated the potential effectiveness of the biogeochemical transformation technology. Indigenous bacteria capable of complete reductive dechlorination of the contaminants may be localized at or immediately downgradient of the Powerex Facility as evidenced by the fact that daughter products such as VC, ethene and ethane are observed sporadically in monitoring wells in this area. Dispersion, diffusion, and dilution appear to be the dominant natural attenuation mechanisms identified for this Site. MNA would be a permanent solution and achieve long-term effectiveness. In the event that contamination at the Powerex Facility is not effectively addressed, additional remedial measures at the Powerex Facility would need to be evaluated by EPA to ensure long-term effectiveness and permanence in Area 2.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

Area 1

Alternative 1 would provide no reduction in toxicity, mobility or volume. Alternatives 2 and 3 would reduce the toxicity and volume of contaminants at the Site through treatment of contaminated groundwater. Alternative 2 removes contaminated groundwater and treats it via air stripping. Alternative 3 uses biological and abiotic processes to degrade contaminants in groundwater to less harmful compounds. In Area 1, Alternative 2 would be the most effective at reducing the mobility of the groundwater contamination by extracting the contaminated groundwater. If Enhanced Anaerobic Bioremediation was the process option used under Alternative 3, TCE and *cis*-1,2-DCE could be transformed into the more toxic VC under anaerobic conditions in the subsurface, prior to degradation to the less toxic ethane. This transformation would be monitored and managed to prevent exposure via drinking contaminated water. Overall, Alternative 2 would provide somewhat greater reductions under this criterion than Alternative 3.

Area 2

Alternative 1 provides no reduction in toxicity, mobility or volume. Alternative 3 reduces the toxicity and volume of contaminants at the Site through treatment of contaminated groundwater using biological and abiotic processes (dilution, dispersion, and diffusion) to degrade contaminants into less harmful compounds. Alternative 4 relies on only natural processes to degrade contaminants and, hence, the reduction in toxicity and volume may vary with location. Therefore, Alternative 3 would be more effective than Alternative 4. If Enhanced Anaerobic Bioremediation was the process option used under Alternative 3, TCE and *cis*-1,2-DCE could be transformed into the more toxic VC under anaerobic conditions in the subsurface, prior to degradation to the less toxic ethane. This transformation would be monitored and managed to prevent exposure via drinking contaminated water. Such management would include the institutional controls that are common to all of the action alternatives evaluated.

5. Short-Term Effectiveness

Area 1

There are no short-term effectiveness issues associated with the No Action Alternative. Alternatives 2 and 3 may have short-term impacts to remediation workers, the public, and the environment during implementation. Alternative 2 is expected to have higher short-term impacts compared to Alternative 3. Remedy-related construction (e.g., well installation and trench excavation) under Alternative 2 would cause some temporary disruptions in traffic. In addition, Alternative 2 has aboveground treatment components and infrastructure that may create a minor noise nuisance and inconvenience for local residents during construction. Exposure of workers, the surrounding community, and the local environment to contaminants during implementation of the three alternatives is minimal. No difficulties are foreseen with managing the required quantity of the injection material needed in Alternative 3, as it is non-hazardous. Drilling activities, including the installation of monitoring, injection, and extraction wells for Alternatives 2 and 3 could produce contaminated liquids that present some risk to remediation workers at the

Site. The potential for remediation workers to have direct contact with contaminants in groundwater could also occur when groundwater remediation systems are operating under Alternative 2. Alternative 2 could increase the risks of exposure, ingestion, and inhalation of contaminants by workers and the community because contaminated groundwater would be extracted to the surface for treatment. However, measures would be implemented to mitigate exposure risks through the use of personnel protective equipment (PPE) and standard health and safety practices. All three alternatives include monitoring that would provide the data needed for proper management of the remedial processes and measures to address any potential short-term impacts to the community, remediation workers, and the environment during construction. Groundwater monitoring and discharge of treated groundwater will have minimal impact on workers responsible for periodic sampling. The time frame to meet groundwater RAOs in Area 1 is expected to exceed 30 years under any of the action alternatives.

Area 2

There are no short-term effectiveness issues associated with the No Action Alternative. Alternative 3 may have short-term impacts to remediation workers, the public, and the environment during implementation. The short-term impacts due to Alternative 4 are minimal as it does not involve active remediation. Alternative 3 is expected to have higher short-term impacts compared to Alternative 4. Exposure of workers, the surrounding community and the local environment to contaminants during implementation of the two alternatives is minimal. No difficulties are foreseen with managing the required quantity of the injection material needed in Alternative 3, as it is non-hazardous. Drilling activities, including the installation of monitoring, injection, and extraction wells for Alternative 3 could produce contaminated liquids that present some risk to remediation workers at the Site. Alternatives 3 and 4 include monitoring that would provide the data needed for proper management of the remedial processes and measures to address any potential short-term impacts to the community, remediation workers, and the environment during construction. Groundwater monitoring will have minimal impact on workers responsible for periodic sampling. The time frame to meet groundwater RAOs in Area 2 is expected to exceed 30 years under any of the action alternatives.

6. Implementability

Area 1

There are no implementability issues associated with the No Action Alternative. Alternatives 2 and 3 are established technologies with commercially available equipment and are implementable. However, the implementation of Alternatives 2 or 3 may be challenging due to the nature of the subsurface materials and the depths of the contaminants. In Area 1, Alternative 3 would be easier to implement than Alternative 2 since it involves the installation of fewer wells and a lesser amount of long-term operations. The additional wells, well vaults, and underground piping and electrical lines that would need to be constructed under Alternative 2 would potentially cause higher disruption than Alternative 3 in the residential area. The bedrock nature of the impacted unit and the large depths of impacts (approximately 200 feet deep) may present technical difficulties under Alternative 2 and Alternative 3. Under Alternative 2, potential issues such as plume migration or sinkhole collapse induced by pumping would require the development of preventative measures. Under Alternative 3, some limitations may be encountered with in-situ injections, including implementation issues due to delivery of injected materials into bedrock at depth, and high levels of sulfate in the formation, which could compete with microbial processes that degrade VOCs. Additionally, multiple injection rounds may be necessary to overcome the sulfate demand in the gypsiferous aquifer unit and achieve the RAOs.

Alternatives 2 and 3 would require O&M for the life of the remedy including routine groundwater quality, performance, and administrative monitoring, as well as CERCLA five-year reviews.

Area 2

There are no implementability issues associated with the No Action Alternative. Alternative 3 is an established technology with commercially available equipment and is implementable. However, the implementation of Alternative 3 may be challenging due to the nature of the subsurface materials and the depths of the contaminants. In Area 2, Alternative 4 would be easier to implement than Alternative 3 since no active remediation would be performed under Alternative 4. Under Alternative 3, some limitations may be encountered with in-situ injections, including implementation issues due to delivery of injected materials into bedrock at depth, and high levels of sulfate in the formation, which could compete with microbial processes that degrade VOCs. Additionally, multiple injection rounds may be necessary to overcome the sulfate demand in the gypsiferous aquifer unit and achieve the RAOs.

Alternatives 3 and 4 would require O&M for the life of the remedy including routine groundwater quality, performance, administrative, and institutional controls monitoring, as well as CERCLA five-year reviews.

7. Cost

Alternative 1, the No Action Alternative, has no costs associated with it since no remedial activities would be performed.

Area 1

The present value cost for Alternative 2 assumes a 30-year treatment and monitoring period and is about $53.8 million. Alternative 3 includes in-situ injection treatment and monitoring for a 30-year period. The present value costs of the different process options under Alternative 3 for Options A, B, C, and D are, $23.25 million, $24.44 million, $21.92 million and $18.32 million, respectively. Alternative 2 is the highest cost option followed by options B, A, C and D under Alternative 3 in that order.

Area 2

Alternative 4 does not involve any active treatment but would include O&M, institutional controls and monitoring for an estimated 30-year period. This alternative also would evaluate the occurrence of natural dechlorination processes in contaminant concentrations in Area 2. The present value costs of Options A, B, C and D under Alternative 3 are $20.68 million, $19.84

million, \$19.51 million and \$12.39 million, respectively. Alternative 4 is the least costly alternative, followed by options D, C, B and A under Alternative 3 in that order.

The scope of work related to the modification of the wellhead treatment system at the Village of Union Springs public wells to ensure the protection of the public water supply is not included in the costs estimates for Alternative 2 through 4. Because the scope would be similar under each of the alternatives, the modification does not change the relative cost effectiveness of each of those alternatives.

8a. State Acceptance

NYSDEC concurs with the selected remedy. A letter of concurrence is attached. (See Appendix IV)

8b. Tribal Acceptance

At conclusion of consultation with the Cayuga Nation, the Cayuga Nation indicated it does not agree with the selected remedy in the ROD.

9. Community Acceptance

EPA solicited input from the community on the remedial alternatives proposed for the Cayuga County Groundwater Contamination Site and received extensive oral and written comments. The attached Responsiveness Summary addresses the comments received during the public comment period. (See Appendix V) Based on the totality of the comments received, the community supports the remedial alternatives selected in this ROD.

PRINCIPAL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a Site whenever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for the migration of contamination to groundwater, surface water, or air, or act as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of alternatives, using the remedy selection criteria which are described above. The manner in which principal threat wastes are addressed provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

The contamination being addressed in this ROD is in the groundwater. Contaminated groundwater is generally not considered to be source material; however, non-aqueous phase liquids (NAPLs) in groundwater may be viewed as source material. Evidence was found during the RI which indicates that NAPL VOCs are present within the groundwater. There is the potential that principal threat wastes could continue to diffuse into the groundwater. The locations with the highest concentration of VOCs contamination were found in Area 1.

SELECTED REMEDY

Summary of the Rationale for the Selected Remedy

Based upon the requirements of CERCLA, the results of the Site investigations, the detailed analysis of the alternatives, and public comments, EPA has determined that the following combination of alternatives satisfies the requirements of CERCLA Section 121, 42 U.S.C. §9621, and provides the best balance of tradeoffs among the remedial alternatives with respect to the NCP's nine evaluation criteria, 40 CFR §300.430(e)(9) described below:

Alternative 3: Enhanced In-Situ Biological and Abiotic Remediation for Area 1, and

Alternative 4: Monitored Natural Attenuation for Area 2.

While Alternative 2: Groundwater Pump and Treat and Alternative 3: Enhanced In-Situ Biological and Abiotic Remediation are both proven technologies that would successfully treat VOC-contaminated groundwater in Area 1, Alternative 2 would be significantly more expensive to construct and implement than Alternative 3. Groundwater Pump and Treat in Area 1 would also have the potential to enhance plume migration from the source area that would require the development of preventative measures. Depending on the process option chosen in Area 2, Alternative 3 would be significantly more expensive to construct and implement than Alternative 4: Monitored Natural Attenuation. Alternative 4 in Area 2 relies on reduced contaminant migration from upgradient areas and natural processes to achieve MCLs in the groundwater.

Although the timeframe to achieve MCLs in the groundwater is somewhat uncertain, in part due to the impact of the mass diffused in the bedrock matrix, the selected remedy is expected to achieve MCLs in a reasonable timeframe. Long-term groundwater monitoring would be performed to track progress towards ensuring that RAOs are achieved at the Site.

Description of the Selected Remedy

The selected remedy includes the following major components:

Common Elements

- Connection of impacted residences to municipal water for their future potable water needs, including any current or new residences impacted by the Site. Existing groundwater treatment systems at three dairy farms will be maintained, as necessary, or connected to the public water system. POETS will be provided, as necessary, and maintained until the connection to the public water supply is completed;
- Development of an Institutional Controls Implementation Action Plan which should specify institutional controls to insure that the remedy is protective. Implementation of institutional controls in the form of any local laws that limit installation of drinking water wells and informational devices such as advisories published in newspapers and letters sent to local government authorities to limit exposure to contaminated groundwater.

- Implementation of a program of long-term monitoring of contaminants in the groundwater plume to track and monitor changes in the concentrations of contaminants and measure progress towards attainment of the RAOs;
- Development of a Site Management Plan (SMP) that will provide for the proper management of the Site remedy post-construction. The SMP will include provisions for any operation and maintenance and long-term monitoring required for the remedy; and periodic certifications by the owner/operator or other entity implementing the remedy that institutional and engineering controls are in place; and

- The remedy will also include measures to ensure that the Village of Union Springs public water supply treatment system is adequately equipped to protect users of its supply from Site-related contamination. While the wellhead treatment system was upgraded in 2001 to treat Site-related contamination that had impacted the supply wells, additional measures need to be implemented to ensure that the system is capable of continuously distributing water that does not exceed drinking water standards for the Site-related contaminants. A backup generator will be provided to power the air stripper during power outages, and a second air stripper (or other comparable system/equipment) will be put in place to ensure that operations are not interrupted during maintenance of the existing air stripper.

Area 1: Enhanced In-Situ Biological and Abiotic Remediation -Alternative 3

The selected remedy involves the in-situ treatment of contaminated groundwater to promote reductive dechlorination of chlorinated solvents in the in the deep portion of the aquifer designated as the D3 and described further below. A network of wells will be installed in Area 1 where chemical agents will be delivered to the subsurface at the impacted depths. Once delivered, these chemicals will promote reductive dechlorination, decreasing contaminant concentrations. Under the selected remedy, both biological and abiotic processes are enabled during the in-situ biogeochemical transformation process to promote reductive dechlorination of chlorinated solvents to achieve federal maximum contaminant levels (MCLs) or more stringent state standards. This remedy component will utilize a flexible approach that could include a combination of one or more process options. The details of the selected process will be determined in a pilot study during the remedial design. The well network will be designed with the placement of wells at high yield locations and will likely close to flow paths. Figure 3 in Appendix I provides the conceptual design of well locations.

Area 2: Monitored Natural Attenuation - Alternative 4

The selected remedy involves monitoring of naturally occurring, in-situ processes, to decrease the mass or concentration of contaminants in groundwater in Area 2. Under this portion of the remedy, additional monitoring wells as shown in Figure 4 will be installed and included as part of the monitoring well network. The monitoring program will consist of quarterly monitoring for parameters such as VOCs, geochemical indicators and hydrogeologic parameters in the monitoring well network. Additional modeling to evaluate the attenuation processes will be performed. The monitoring program will be used to evaluate remedy effectiveness and to ensure protection of human health and the environment. The monitoring program will be designed to verify that natural attenuation is occurring and will meet the RAOs.

Contingency Remedies for Area 1 and Area 2:

The contingency remedies for Area 1 and/or Area 2 will be implemented if EPA determines that one or more of the following circumstances occur:

- Enhanced In-Situ Biological and Abiotic Remediation in Area 1 and/or Monitored Natural Attenuation in Area 2 in conjunction with source control at the Powerex Facility is unlikely to achieve MCLs in a reasonable timeframe based on data collected and thus is not protective of human health or the environment; or

- Long-term monitoring of groundwater and surface water in the vicinity of the Village of Union Springs reveals that the VOC contamination is increasing and creating an unacceptable risk to receptors, such that the actions undertaken in Area 1 or Area 2 are not protective of human health and environment; or

- Long-term monitoring reveals stalling/incomplete reductive dechlorination of the contaminants of concern at the Site, despite efforts to modify the treatment regime; or

- The Area 1 pilot study for enhanced in-situ biological and abiotic remediation called for in this ROD demonstrates that the RAOs are unlikely to be met in a reasonable timeframe.

Area 1: Groundwater Pump and Treat (Alternative 2)

The contingency remedy involves the extraction of groundwater via pumping wells and treatment prior to disposal. Groundwater is pumped to remove contaminant mass from areas of the aquifer with elevated concentrations of contaminants. It is estimated that groundwater extraction wells would be installed in the D3 zone of the aquifer. A treatment plant with a capacity of approximately 400 gpm would be constructed within or near the Site to achieve the RAOs. Extracted groundwater with VOC contamination would be treated by air stripping. Figure 5 in Appendix I provides the conceptual design of well locations. Air stripper effluent may be treated with a thermal oxidizer system, in accordance with federal and State regulations prior to being discharged into the atmosphere, if necessary. Due to the variation in hydraulic and hydrogeologic properties, as well as the contaminant concentrations, during a remedial design phase, pilot studies and performance tests will be conducted to determine the number and location of extraction wells needed to ensure that the required RAOs are achieved. During the remedial design, a determination will also be made either to discharge treated extracted groundwater to surface water or to reinject it to groundwater.

Area 2: Enhanced In-Situ Biological and Abiotic Remediation (Alternative 3)

The contingency remedy involves the in-situ treatment of contaminated water to promote reductive dechlorination of chlorinated solvents in the D3 zone in Area 2. A network of wells will be installed in Area 2 where chemical agents will be delivered to the subsurface at the impacted depths. Once delivered, these chemicals will promote reductive dechlorination, decreasing contaminant concentrations. Under the contingency remedy, both biological and abiotic processes are enabled during the in-situ biogeochemical transformation process to promote reductive dechlorination of chlorinated solvents. This remedy is a flexible approach that could include a combination of one or more process options as described in the description of alternatives above. The details of the selected process will be determined in a pilot study during a remedial design phase. The well network will be designed with the placement of wells at high yield locations and will likely be biased closer to flow paths. Figure 3 in Appendix I provides the conceptual design of well locations.

The Powerex Facility continues to be a source of VOC contamination to groundwater at this Site. The source investigations and other response actions for the Powerex Facility are being addressed by GE with NYSDEC oversight pursuant to New York State law. Remedial actions for the Powerex Facility are not the focus of this decision document, although successful remediation (i.e., source control or removal) of the source area(s) at the Powerex Facility is important to the full realization of the benefits of the selected remedy in this ROD. In the event that source control is not successfully implemented pursuant to New York State law, EPA may elect to evaluate additional options at the Powerex Facility pursuant to CERCLA to ensure the effectiveness of the selected remedy.

The environmental benefits of the preferred remedy may be enhanced by giving consideration, during the design, to technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy.[3] This will include consideration of green remediation technologies and practices.

Summary of the Estimated Selected Remedy Costs

The estimated capital, O&M and present worth costs of the selected remedy are discussed in detail in the FS Report. The cost estimates, which are based on available information, are order-of-magnitude engineering cost estimates that are expected to be within +50 to -30 percent of the actual cost of the project.

The estimated capital, O&M and present worth cost for each area and the total cost are presented below.

Alternative	Capital Cost	Annual O&M	Present Worth
Area 1	$16.29 M	$163,300	$18.32 M
Area 2	$246,000	$ 134,000	$1.91 M
Total	**$16.54 M**	**$297,300**	**$20.23 M**

Expected Outcomes of the Selected Remedy

The selected remedy addresses the contamination identified during the RI/FS in the groundwater in Areas 1 and 2 of the Site. The results of the risk assessment indicate that future use of

[3] See http://epa.gov/region2/superfund/green_remediation

groundwater at the Site will pose an unacceptable increased future cancer risk and an unacceptable non-cancer hazard risk to human health if no action is taken. The selected remedy for Area 1 and Area 2 will be used to protect drinking water supplies and remediate contaminated groundwater and will restore the aquifer in Area 1 and Area 2 as a potential source of drinking water in a reasonable time period by reducing contaminant levels to the federal MCLs and state standards.

STATUTORY DETERMINATIONS

As noted above, CERCLA Section 121(b)(1) mandates that a remedial action must be protective to human health and the environment, cost-effective, and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants at the Site. CERCLA 121(d) further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA 121(d)(4). For the reasons discussed below, EPA has determined that the selected remedy meets the requirements of CERCLA Section 121.

Protection of Human Health and the Environment

The selected remedy will protect human health and the environment because it will restore groundwater quality at the Site to drinking-water standards over the long-term. Protection will also be achieved by eliminating all remaining direct-contact risks to human health and environment associated with contaminated groundwater. Institutional controls will also assist in the protectiveness of human health and the environment over both the short and long-term by helping to control and limit exposure to hazardous substances.

Compliance with ARARs

The selected remedy is expected to achieve federal MCls or more stringent State standards for the contaminants of concern in the groundwater. The contaminants of concern and the relevant MCLs are as follows: *cis*-1,2-Dichloroethene (5 µg/l); Trans-1,2-dichlorethene (5 µg/l); TCE (5 µg/l) and VC (µg/l) .

See also Table 7 for a list of all Cleanup Levels for Contaminants of Concern. A full listing of the ARARs, TBCs and other guidelines for implementation of the select remedy is presented at Tables 8-a, Table 8-b and Table 8-c.

Cost-Effectiveness

A cost-effective remedy is one whose costs are proportional to its overall effectiveness (NCP Section 300.430(f)(1)(ii)(D). Overall, effectiveness is based on the evaluations of long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness. EPA evaluated the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume though treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness.

Each of the alternatives underwent a detailed cost analysis. In that analysis, capital and annual O&M costs were estimated and used to develop present-worth costs. In the present-worth cost analysis, annual O&M costs were calculated for the estimated life of each alternative. The total estimated present worth cost for implementing the selected remedy in Areas 1 and 2 is $20.23 million.

Based on the comparison of overall effectiveness to cost, the selected remedy meets the statutory requirement that Superfund remedies be cost effective (NCP Section 300.430(f)(1)(ii)(D)) in that it is the least-cost action which will achieve groundwater standards within a reasonable time frame. The results of the matrix diffusion analysis support the use of 30-year timeframe for planning and estimating purposes to remediate groundwater, although remediation timeframes could exceed this estimate.

Preference for Treatment as a Principal Element

By using a combination of alternatives, to the maximum extent practicable, the statutory preference for remedies that employ treatment as a principal element is satisfied through the use of both biotic and abiotic in-situ remediation of the groundwater in Area 1, which represents the most contaminated portion of the groundwater plume.

Five-Year Review Requirements

This remedy will not result in hazardous substances, pollutants, or contaminants remaining at the Cayuga County Groundwater Contamination Site above levels that would allow for unlimited use and unrestricted exposure. However, because it may take more than five years to attain the cleanup levels, pursuant to Section 121(C) of CERCLA, policy reviews will be conducted no less often than once every five years after the completion of construction to ensure that the remedy is, or will be, protective of human health and environment.

DOCUMENTATION OF SIGNIFICANT CHANGES

The preferred remedy identified in the Proposed Plan, released for public comment on July 16, 2012, was Alternative 3: Enhanced In-Situ Biological and Abiotic Remediation for Area 1, and Alternative 4: Monitored Attenuation for Areas 2 and 3, as well as, institutional controls, connection of impacted residential wells to public water, and maintenance of exisiting POETs. The Proposed Plan also identified Alternative 2: Groundwater Pump and Treat and Alternative 3: Enhanced In-Situ Biological and Abiotic Remediation as contingency remedies for Area 1 and Area 2, respectively. EPA received a request to extend the public comment period from GE, and extended the comment period for an additional 30 days. The comment period closed on September 17, 2012.

In response to the community input, EPA determined that some modifications to the remedy presented in the Proposed Plan are warranted:

In developing the Proposed Plan, EPA assumed the 2001 upgrades to the treatment system at the Village of Union Springs well field were sufficient to protect consumers of its supply. During the public comment period several commenters noted that the existing equipment, while effective under the present circumstances, was not capable of ensuring the continuous distribution of water that met drinking water standards for Site-related contaminants. As a result, the remedy will also include measures to ensure that the Village of Union Springs public water supply treatment system is adequately equipped to protect users of this supply from Site-related contamination. A backup generator will be provided to power the air stripper during power outages, and a second air stripper (or other comparable system/equipment) will be put in place to ensure that operations are not interrupted.

After the close of the public comment period, EPA and the Cayuga Nation continued in further government-to-government consultation based on comments that had been made by the Nation. A meeting between EPA and the Cayuga Nation was held on February 5, 2013, a summary of which has been placed in the administrative record. EPA has determined to implement the selected remedies for Areas 1 and 2 as identified in the Proposed Plan but defer the cleanup decision for Area 3. In accordance with concerns expressed during the consultation, as well as concerns received during the public comment period, additional monitoring will be performed in Area 3 to further assess the impacts to surface water in Union Springs and the effects to ecological receptors.

In addition, specific criteria for implementing either or both of the contingency remedies, which were not part of the Proposed Plan, have been included in this ROD.